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Swamp Rabbit

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FINAL REPORT

"Current Status and Distribution of the Swamp Rabbit in Illinois"

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CURRENT STATUS AND DISTRIBUTION OF THE SWAMP RABBIT IN ILLINOIS

INTRODUCTION

The swamp rabbit (Sylvilagus aquaticus) is a large, relatively dark lagomorph closely related to the eastern cottontail (S floridanus). It inhabits wooded swamps, river bottoms, and lowland areas throughout its range which includes major portions of Texas, Oklahoma, Louisiana, Arkansas, Mississippi, Alabama, and Georgia. Kansas, Missouri, Illinois, Indiana, Kentucky, Tennessee, and South Carolina also contain peripheral habitats at its range extremes (Hall and Kelson 1959).

Reports of swamp rabbits in Illinois indicate occurrence is largely in the "wooded bottoms of the Ohio and Mississippi rivers in southern Illinois" (Nelson 1909). Cory (1912) referenced Howell in describing the northern limit of its range in Illinois as a line extending from Grand Tower, Jackson County to 7.5 km south of Golconda in Pope County (Figure 1). Cochran (1949) felt the range was expanding, adding Jackson, Perry, Jefferson, Hamilton, and Gallatin counties. Layne (1959) collected a specimen in Marion County, and believed there were reliable reports from Randolph County. Klimstra and Roseberry (1969) reported specimens from Wayne County and documented reports from Gallatin, Wabash, Lawrence, Washington, Bond, and Calhoun counties as reliable. Terrel (1969) validated reports from Edwards, Wayne, and White counties.

Swamp rabbit habitat is characterized as wooded floodplains along borders of lakes, streams, and swamps (Chapman and Feldhamer 1981, Schwartz and Schwartz 1981). Rarely are they found far from open water,

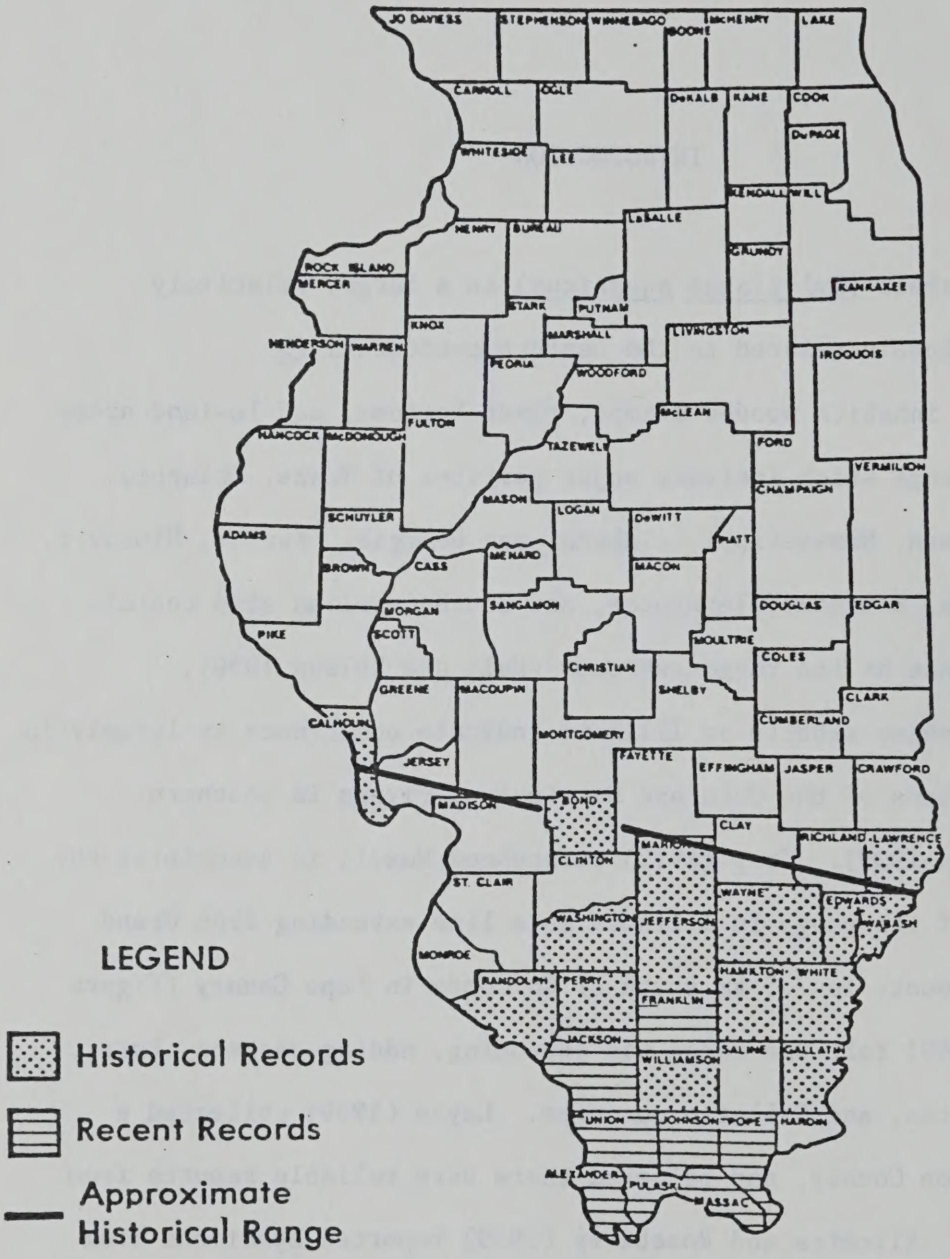

Figure 1. Historical and recent swamp rabbit records in Illinois (recent represents 1984-85 study).

although there is occasional of utilization upland sites as refuge from flood waters and for early season herbaceous vegetation (Seton 1953, Lowe 1958, Hunt 1959, Conaway et al. 1960). Swamp rabbits in Missouri occur most commonly in lowland hardwood forests (Korte 1975). They were common in the formerly abundant canebrakes (Harrison and Hickie 1931) in Indiana, and generally associated with southern swamp forests (Terrell 1972).

Special study of the Illinois swamp rabbit has never been conducted; the available fragments of information fail to define its need. Historical reports suggest it once was widely distributed and fairly common in floodplain forests of the Cache, Big Muddy, Kaskaskia, Little Wabash, Saline, Wabash, Ohio, and Mississippi rivers. Recent evidence suggests it is less common than previously, and may be absent or nearly absent from most interior drainages.

Habitat loss is believed responsible for population declines and restricted distribution. The principal cause is timber harvest and conversion to agriculture, as all but the wettest areas are vulnerable. Graber and Graber (1976) estimated loss of Illinois bottomland oak-gum-cypress forests at 25% and elm-ash-cottonwood forests at 35% from 1962-1973. Missouri (Korte and Fredrickson 1977), Kentucky (Nelson 1974), and Indiana (Mumford and Whittaker 1982) experienced similar habitat losses and subsequent declines in swamp rabbit numbers and distribution.

Although rate of habitat loss may be declining, loss of critical habitats is continuing. Water control projects such as levees and drainage ditches allow tillage of previously wet areas (Fredrickson 1979b). Federal budget cutbacks currently limit funds for such projects, but local interests have expressed continued desire to "improve" water control capabilities. Such improvements promoted high rates of habitat destruction on the lower Mississippi River between 1937 and 1978 (MacDonald et al.

1979). Presently farm economy prevents land clearing from being economical; but, the cyclical nature of farming may reverse and encourage further habitat destruction.

The remaining bottomland forests are wet, and often subject to intensive flooding; they typically lack dry buffer areas for rabbits to move to during floods. The limited areas of dry ground may concentrate rabbits, and increase vulnerability to hunters, poachers, and predators (Svihla 1929, Conaway et al. 1960, Toll et al. 1960, Korte and Fredrickson 1977). The most intensive flooding often coincides with spring breeding seasons, and probably has significant effects on rabbit reproduction (Fredrickson 1979a, Conaway et al. 1960). Conaway et al. (1960) reported a high rate of total litter resorption during severe spring flooding.

ACKNOWLEDGEMENTS

During the conduct of this project, many Cooperative Wildlife Research Laboratory staff and students contributed to the effort; especially E. Anderson, M. Maffei, and T. Nelson. Portions of this report are from M. Kjolhaug's unpublished Master's thesis (in preparation) in partial fulfillment of the requirements for an MA degree in Zoology at SIU-C. The study began as an Illinois Department of Conservation Federal Aid Project W-96-R contracted with the Cooperative Wildlife Research Laboratory. It was abruptly terminated by the Illinois Department of Conservation prior to scheduled completion. This report is in fulfillment of a separate contract between the Laboratory and the Illinois Department of Conservation to complete Job A of the Federal Aid Project (Location of swamp rabbit habitats in southern Illinois) and portions of Job B (Monitoring status, distribution and abundance) that had been completed before termination.

OBJECTIVES

1. Determine historical and current abundance and distribution of the swamp rabbit in Illinois.

METHODS

The historical distribution of the swamp rabbit in Illinois was determined through reveiw of literature and various museum collections. Potential habitats for the current distribution study were identified using several methods. LUDA-GIROS (Anderson et al. 1976, Mitchell et al. 1977) maps prepared by the Illinois Department of Conservations (IDOC) (Peter Roberts, IDOC, pers. comm.) were used to identify forested wetlands in the southern portion of the state. Wetland maps provided by the Illinois Natural History Survey (INHS) were used to identify additional wet soil shrub-swamp types along the Cache and Big Muddy rivers. EROS (EROS Data Center, Souix Falls, SD) high altitude infrared photographs were used to identify additional habitats along the Misssissippi River from Alexander County to Jackson County. Additional potential habitats were identified using historical locations checked on most recent 1:20,000 or 1:40,000 ASCS (Agricultural Stabilization and Conservation Service, Salt Lake City, UT) air photos.

Hunter-cooperators were recruited by announcements of the project placed throughout likely portions of the state. Post offices, hardware stores, cafes, grocery stores, and other locations with high potential for encounter by hunters were solicited to cooperate. Individuals with interest were encouraged to call the CWRL (Cooperative Wildlife Research

Laboratory, Southern Illinois University at Carbondale, Carbondale, IL 62901) collect. These were interviewed to identify potential habitats.

Ground checks were conducted at habitats with the highest probability of supporting swamp rabbit populations. Presence and relative abundance were determined by observations of rabbits, pellets on logs (Terrel 1969), vegetation clippings, tracks, and other sign.

Detailed site information was documented (Appendix A); subjective descriptions were made of various habitat features. Ownership of sites was determined from most recent county plat books. Area size included contiguous bottomlands and any habitat within 200 m considered suitable, and was calculated using a dot grid (scale: 1.6 ha per dot). Areas utilized were calculated as the entire contiguous area of the site where rabbit sign was found in any part of that site.

Botanical nomenclature (Appendix B) follows Mohlenbrock (1975); common names are used throughout the text. Mammalian nomenclature follows Hoffmeister and Mohr (1972).

RESULTS

Distribution

Intensive searches for swamp rabbits or their sign were conducted in 11 counties with limited searches in 3 others (Appendix C); all but Saline had historical records. Sign was found in Alexander, Franklin, Jackson, Johnson, Massac, Pope, Pulaski, Union counties associated with Bay Creek, Big Muddy, Cache, Mississippi, and Ohio river drainages (Figure 2). Sign was lacking in Gallatin, Lawrence, Saline, Wabash, Wayne, and Williamson counties. Additional county records since 1972 may include Clay, Gallatin, Jefferson, Wayne, and White counties (Mike Carter, Illinois Department of Conservation, pers. comm.). Current distribution in Illinois since 1972 is summarized in Figure 1. Although Bond, Calhoun, Edwards, Hamilton, Marion, Perry, and Randolph counties had historical records, they were not searched. Following are summaries of distribution where their presence was confirmed. Brief descriptions for specific sites appear in Appendix D.

Site checks

Alexander County

Ten general areas were searched in Alexander County; 6 areas of Mississippi River floodplain forest comprising 2,295 ha, 3 Cache River bottomlands comprising 617 ha, and 82 ha of bottomlands along Clear Creek. Swamp rabbits were documented at all sites visited on the Mississippi and Cache rivers, but not along Clear Creek. Observations suggest nearly all suitable habitats were occupied along the Mississippi River from Burnham Island south to Cairo, and along the Cache River from its confluence with the Ohio upriver to Tamms. Habitat along these areas was mostly continuous

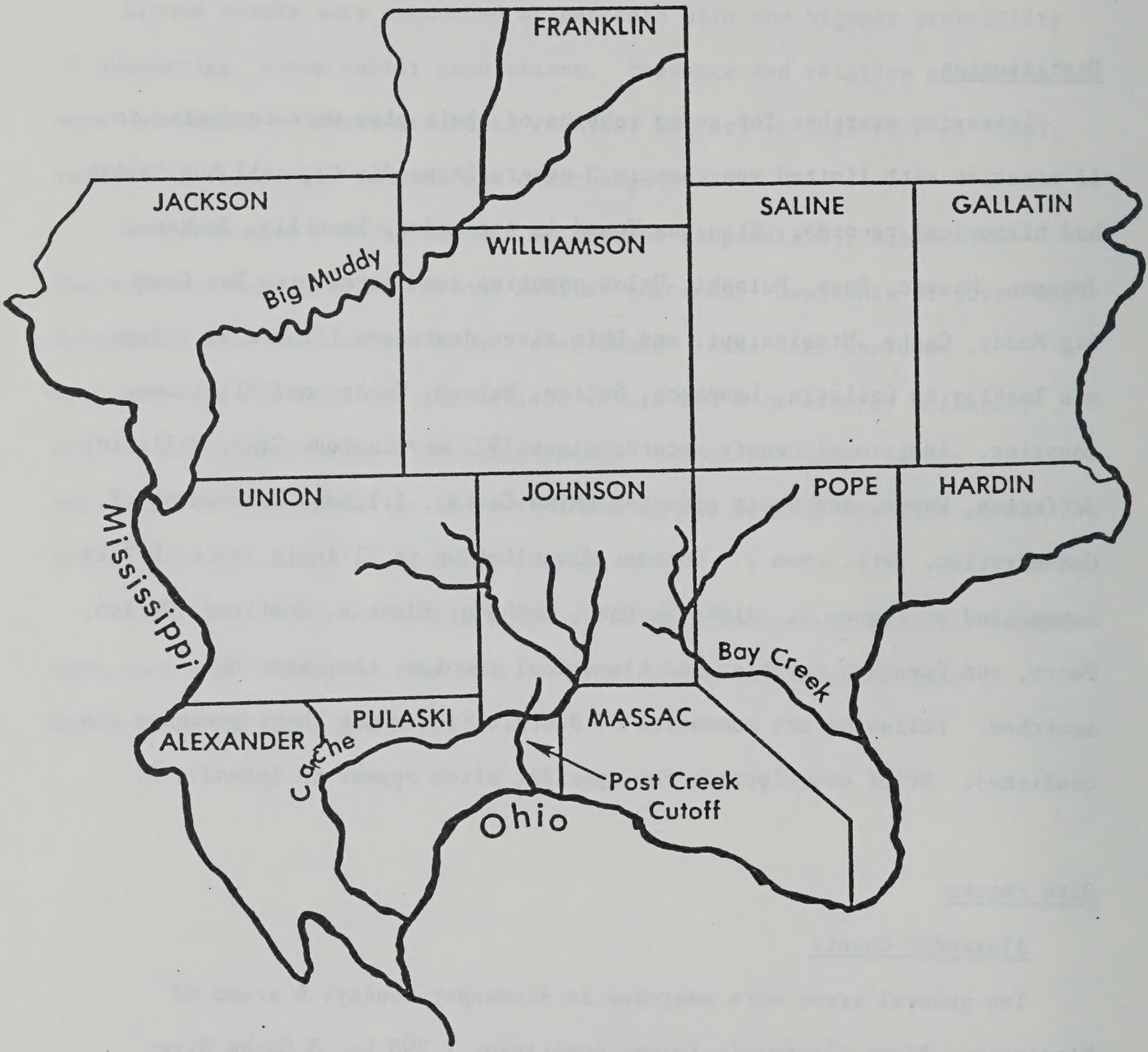

Figure 2. River drainages currently supporting swamp rabbit populations in southern Illinois, 1984-85.

but often limited to thin corridors along the edge of rivers and levees that connect larger blocks of bottomland forest.

Johnson County

Sites checked in Johnson County were concentrated in the southwest along Cache River drainage and in the southeast along Bay Creek. Swamp rabbits inhabit at least 750 ha in the Little Black Slough-Heron Pond area, and 410 ha in the Reevesville and Grantsburg area. Additional habitats of 820 ha along the Cache River may support rabbits, although no sign was found.

Massac County

Site checks were conducted at 10 locations in Massac County including along Cache and Ohio rivers, Bear Creek, and small tributaries. Total area occupied by rabbits was approximately 1,410 ha. Other than Mermet Lake, all sites visited were small, sometimes connected by narrow strips of habitat, or narrow corridors along rivers. Areas lacking rabbits were smaller, isolated, and located on small tributary streams.

Union County

Four general areas were searched in Union County included the Big Muddy-LaRue Swamp and Wolf Lake-Otter Pond areas, Union County CA, and the Mississippi River southwest of Ware. Swamp rabbits occurred on the Union County Refuge and a small portion near Wolf Lake, representing a total of 880 ha. The 800 ha site southwest of Ware was searched during flooding; status of swamp rabbits here was uncertain but probable.

Pulaski County

Six areas totalling 700 ha in Pulaski County were searched; sign was found in 3 areas totalling 540 ha. Approximately 465 ha of bottomland and swamp forest along the Cache River between Alexander County and Highway 57 were not searched and but may support swamp rabbits. All bottomlands were along floodplains of Cache and Ohio rivers, or on smaller tributaries immediately adjacent. Most former forest was logged and converted to agriculture; the remaining areas were wet. Areas where rabbits were found were greater than 100 ha; those lacking rabbits were less than 60 ha.

Franklin County

Fourteen checks were made; 3 yielded sign. Total area searched was approximately 5,270 ha, almost all within the Big Muddy floodplain in the central portion of the county; approximately 1,500 ha were occcupied by low densities. Continuous bottomland forest existed for nearly 35 km along the river, its forks and tributaries.

Other counties

Three areas totalling at least 4,550 ha were searched in Jackson County; sign was found only at Oakwood Bottoms, a planned green tree reservoir with more than 4,000 ha. Three additional areas totalling 235 ha were searched in Pope County; sign was found in one 75 ha site along Bay Creek.

Total area and ownership of habitats

Total area of sites known to support swamp rabbits is 12,485 ha; approximately 4,795 ha are privately owned, 3,465 ha state owned, and 4,225 ha federally owned (USFS), of which 4,000 ha is the Oakwood Bottoms. Ownership of privately held lands includes 1,250 ha commercially owned (by banks) in Franklin County, 1,396 owned by timber companies and the remainder primarily owned by farmers. An additional 1,898 ha of unsearched privately owned land likely supports swamp rabbits, based on proximity to known populations, and size and vegetation composition of the areas.

Vegetation of sites searched

The most commonly occurring canopy species in areas with swamp rabbits are pin oak, red maple, cottonwood, and sweetgum (Table 1). Understory species most encountered are poison ivy, blackberry, red maple, and giant cane (Table 2). The most commonly occurring canopy species in areas without swamp rabbits are pin oak, silver maple, sycamore, and white oak (Table 3). Understory species most encountered are poison ivy, hackberry, silver maple, and river birch (Table 4). Herbaceous vegetation and ground cover could not be recorded because most sites were visited during winter and early spring.

Table 1. Relative occurence of tree species at sites with swamp rabbits, December-June, 1984-85.

Species	Relative occurence
Pin Oak	15.5
Red Maple	11.7
Cottonwood	9.7
Sweetgum	6.8
Sycamore	5.8
Hickory	4.9
Red Oak	4.9
Swamp Chestnut Oak	4.9
Swamp White Oak	3.9
American Elm	3.9
Green Ash	3.9
River Birch	2.9
Bur Oak	1.9
Cypress	1.9
Silver Maple	1.9
Oak	1.9
Tulip Tree	1.9
Beech	1.0
Spanish Oak	1.0
Sugar Maple	1.0

Table 2. Relative occurence of understory species at sites with swamp rabbits, December-June, 1984-85.

Species	Relative occurence
Poison Ivy	10.3
Blackberry	8.8
Red Maple	8.8
Giant Cane	8.8
Grape	7.4
Japanese Honeysuckle	7.4
Willow	4.4
Buttonbush	4.4
American Elm	4.4
Catbriar	4.4
Pin Oak	2.9
Green Ash	2.9
Cottonwood	2.9
Maple	2.9
Jewelweed	2.9
Bur Oak	1.5
River Birch	1.5
Oak	1.5
Box Elder	1.5
Hickory	1.5
Pawpaw	1.5
Sugar Maple	1.5
Sycamore	1.5
Virginia Creeper	1.5
Fleabane	1.5
Hackberry	1.5

Table 3. Relative occurence of tree species at sites without swamp rabbits, December-June, 1984-85.

Species	Relative occurence
Pin Oak	16.7
Silver Maple	7.5
Sycamore	6.9
Swamp White Oak	5.7
Hickory	5.7
Cypress	5.2
American Elm	5.2
Red Maple	4.6
Sweetgum	4.6
Cottonwood	4.6
Tupelo	4.0
Shagbark Hickory	4.0
River Birch	4.0
Burr Oak	3.4
Green Ash	3.4
Red Oak	2.9
Sugar Maple	2.3
Post Oak	1.7
Oak	1.7
Willow	1.1
Hackberry	1.1
Honey Locust	1.1
Bitternut Hickory	.6
Shumarrd's Oak	.6

Table 4. Relative occurence of understory species at sites without swamp rabbits, December-June, 1984-85.

Species	Relative occurence
Poison Ivy	10.6
Hackberry	6.2
Silver Maple	6.2
River Birch	6.2
American Elm	6.2
Red Maple	5.3
Japanese Honeysuckle	5.3
Greenbriar	5.3
Pin Oak	5.3
Hickory	4.4
Green Ash	3.5
Sycamore	3.5
Bur Oak	3.5
Red Oak	2.7
Giant Cane	2.7
Blackberry	2.7
Hackberry	1.8
Box Elder	1.8
Cottonwood	1.8
Sugar Maple	1.8
Sweetgum	1.8
Virginia Creeper	1.8
Fleabane	.9
Grape	.9
Flowering Dogwood	.9
Trumpet Creeper	.9
Buttonbush	.9
Winged Elm	.9
Multiflora Rose	.9
Swamp White Oak	.9
Post Oak	.9
Pawpaw	.9

DISCUSSION

Total area of habitat occupied by swamp rabbits should be considered a maximum value for locations with identified populations. The area of an occupied site was calculated as the total area continuous or within 200 m (a subjective potential dispersal distance) of sites where any sign was observed. Rarely was use continuous throughout the entire area; most often it was confined to portions offering good cover. This was most evident in the more northern locations (Franklin and Jackson counties) and sites along the Cache River. Portions of the area calculated as inhabited are less suitable and do not usually support rabbits; they may provide refuge during floods and important dispersal routes critical to a species at the limits of its distribution. The presence of large tracts of bottomlands on the Big Muddy and in Oakwood Bottoms is critical to maintenance of populations; low rabbit densities would probably not persist if habitat destruction caused significant loss or fragmentation of the areas. Disturbance is most likely to occur along the Big Muddy where the majority of habitats supporting swamp rabbits are owned by banks, lumber companies, and coal companies.

The state of Illinois is the most important landholder of areas supporting swamp rabbit populations. The most important of these are in Alexander, Johnson, Massac and Union counties and are managed as refuges, parks, natural areas, and wildlife management areas. All generally maintain habitat compatible with swamp rabbit needs; but, there are no specific management efforts.

Although federally owned land with swamp rabbit populations totals 4,225 ha, these are less significant than state and private holdings.

Densities at the 4,000 ha Oakwood Bottoms site are low and use is localized; the 1,360 ha area managed as greentree reservior is flooded (and unsuitable) from October through February. In addition, the 1,400 ha of plantation types are of limited value. The remainder of federal lands are small segments of acceptable habitats; adjacent private and state lands are significant in maintenance of populations.

Many important habitats are in private ownership; most are owned by farmers and too wet to cultivate. Generally all should be viewed as insecure, with potential for destruction based on changes in the farm economy and construction of water management projects. Private industrial and commercially owned lands on the Big Muddy River are likely areas for habitat loss. The purchase of land by The LaSalle Bank and Trust Co. may be speculative in nature; future plans could include deforestation, farming, or energy developement. Pressure on local politicians could encourage construction of ditches and levees, altering the hydrology of the area and allowing diverse uses.

Vegetation of searched habitats

Differences in vegetation between areas with swamp rabbits and those without appears minimal; 8 of 10 most encountered trees were the same with and without rabbits. Although only 4 of the 10 most encountered understory species were the same, there was nearly 80% overlap in composition of understory species. It is most likely that if differences occured, they would be revealed in the understory. Most rapid response to changes in hydrology resulting from ditches, levees, and flooding, and disturbances in the canopy would be understory. The subjective nature of accessing species composition prohibited intensive analysis of data.

Timing of site checks

Late fall and early winter are best to conduct site checks because Swamp rabbits begin intensive use of pellet logs in late October and decline of herbaceous vegetation increases visability. In fall there is relatively high rabbit abundance, so potential for observations of rabbits and sign is great. Delayed searches may be confronted with floods and vegetation green-up which inhibit access and flooding limits access and hides rabbits and their sign. Flooding in February and March is followed by green-up in April. Additionally, pellets accumulated on logs are often washed off. The behavior of rabbits during flooding is variable; they may move to the drier perimeters or remain among the floating debris (Conaway et al. 1960, CWRL unpublished). Additionally, pellets accumulated on logs are often washed off. The prevalence of log use probably decreases in late winter, thus sites that may have abundant pellet logs prior to flooding lack this obvious sign after floods. Also, pellets that persist after flooding rapidly decay due to heat and spring rain; they disappear totally in 12 to 24 days post-deposition (Lord 1963). Interpretation of status and relative abundance of rabbits in all sites visited must be viewed in light of conditions at the time of search (Appendix C).

Identification of potential habitats

The use of the LUDA mapping system for identification of potential swamp rabbit habitat was moderately successful. Often areas identified were swamp forest; but, floodplains bordering these swamps provide the suitable habitat. Several important areas were not identified by LUDA (ie:Bumgard Island, Dogtooth Bend, Burhnam Island); generally these were subject to intense flooding during spring but were relatively dry the remainder of the year.

Sites identified by hunters usually supported swamp rabbits and were useful in identification of a few unknown populations. Most often, those identified by hunters were already known through other sources. Because the majority of hunters used a few well known areas, identified sites were few. The information provided by IDOC staff and other interested persons was helpful.

The use of high altitude infrared photography was of limited value; generally areas identified had been previously noted by other methods. The expense of maps for adequate coverage may not be feasible; available without purchase they could be a useful source of information. Although a specific color "signature" for bottomland forest was not apparent, topographic features were identifiable and divisions between bottomland and upland forests were evident.

A few additional sites were identified through the literature; but in southern counties these were known from other sources. No additional swamp rabbit populations were found using this source or the shrub-wetland maps provided by the INHS.

SUMMARY

A thorough study of swamp rabbit distribution in Illinois has never been conducted; the historical documentation (Figure 2) is based on a compilation of studies, and should be viewed with caution. It is likely that recent reports (Cochran 1949, Layne 1959, Klimstra and Roseberry 1969, and Terrel 1969) were not range extensions, but rather previously unreported populations. Habitat losses have occurred throughout the

1900's, with a corresponding decrease in swamp rabbit distribution (Terrel 1969, Korte and Fredrickson 1979). It is likely that the most extensive distribution was prior to this period; but, extent cannot be determined. Presumably continuous swamp rabbit populations once inhabited bottomlands along the Big Muddy, Cache, Little Wabash, Mississippi, Ohio, and Wabash rivers as far north as a line running east-west through Calhoun and Lawrence counties, with the extreme southern counties the stronghold.

Based on CWRL searches, Alexander, Johnson, Massac, Pulaski, and Union counties support limited, site-specific populations of swamp rabbits. Sign in Franklin, Jackson, and Pope counties suggests low densities and sparse,.limited distributions. Seven counties with historical records were not included in this aborted study; hence current status in these is unknown. In addition, searches of Gallatin, Lawrence, Wabash, and Wayne counties were conducted after spring flooding or when sites were covered with herbaceous vegetation. These were reported to support swamp rabbits; subsequent searches may reveal isolated, sporadic populations. Other recent records (Mike Carter, IDOC, pers. comm.) were based on unsubstantiated reports and must be viewed with caution. A conclusive distribution of the swamp rabbit in Illinois thus cannot be derived from this limited effort.

The most significant disturbances to swamp rabbit habitat are construction of levees, drainage ditches, and land-use conversion to agriculture. Much of the bottomland forests today reflect "islands" of habitat surrounded by agriculture, with no opportunity for reestablishing populations when extirpated; this is especially critical in the more northern portions of its range. The geographical distribution of any species is dynamic (McArthur 1972), even in conditions of relative habitat stability. Statewide distribution of the swamp rabbit has probably always experienced advances and recessions over time, as expected for those forms occupying marginal habitats or relatively severe climates at range extremities. In the past, the continuous nature of bottomland forest habitat throughout southern Illinois allowed reestablishment of northern swamp rabbit populations when extirpated from portions of the range. Fragmentation of habitats during the past 100 years has made repopulation by more secure southern populations less likely, and has created situations where barriers (agriculture fields, cities) limit dispersal into otherwise suitable habitats (Udvardy 1969). In addition, low survival or reproduction at range extremes may keep populatons from reaching levels that encourage dispersal (Udvardy 1969, Seivart and Keith 1985).

It is unlikely that swamp rabbit in Illinois will recolonize any vacant habitats; rather, they will probably continue to become extirpated from the remaining "islands". This process will continue until they are limited to the few remaining habitats in public ownership and private conservation lands, or less suitable swamp habitat. Although the population in Illinois is a relic, at least 20 sites still support rabbits. Efforts should be initiated to assure survival of these local populations, and to identify additional populations. Selective cutting of over 7,500 ha of state and federal bottomland forests now supporting swamp rabbits should improve their quality, encouraging higher population densites better able to survive relatively severe weather in Illinois (CWRL unpubl.). Notifying owners that their lands support swamp rabbits may provide incentive to preserve such areas.

Swamp rabbits are a game animal in Illinois; season lengths and bag limits are as those for eastern cottontails. No estimates of contribution to the rabbit harvest is available, but it undoubtedly is small. Although they are not important economically or recreationally, as a native species it is the responsibility of the state to insure perpetuity. This can be accomplished by identifying habitats supporting populations, and providing full protection for the most important areas. Preservation of a viable swamp rabbit population in Illinois will require an active effort. Expediting this effort will allow the greatest likelihood of success; delaying it will certainly relegate Illinoisans to a few "museum piece" populations.

RECOMMENDATIONS

1. Sites which have been identified as supporting swamp rabbit populations should be monitored on an annual basis. Searches should be conducted at approximately the same time each year, and should preferably occur during November, December, or January. It will allow continued updating of distribution, and may reveal trends in abundance. This is especially important in sites with low densities, and those which have a high potential for disturbance or destruction.

2. Sites suggested as having high potential for supporting rabbit populations but not visited or visited at unsuitable times should be surveyed as soon as possible.

3. Landowners whose property supports swamp rabbit populations should be alerted to that fact and encouraged to protect populations (ie: habitat protection, restricted hunting).

4. Contacts with hunter-cooperators should be continued and expanded. They are a good source of information for relative abundance and distribution.

5. Disturbances which open the forest canopy and increase ground cover improve habitat quality. Selective logging of state and federal property with low density populations may improve habitats and assure more secure populations. Creation of slash piles may further increase attractiveness of habitats, and enhance over-winter survival (CWRL unpubl.). Such management may be extremely beneficial and can be financed in a large part by proceeds from sale of timber.

6. The current status of swamp rabbits as a game animal in the state should be evaluated. It is irresponsible to allow hunting of a species without knowing its current status or the effects of hunting pressure; it's effects on rabbits should be studied. If it hunting is negatively affecting their status, protection should be initiated. Probably high density populations in large areas can support current hunting pressure; but it will adversely impact small, isolated, and more northerly populations.

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Appendix A

SWAMP RABBIT DATA FORM

GENERAL INFORMATION:

Date: ____________ Investigator: ____________

General Location: ____________ Topographic Map: ____________

County: ____________ Section: ______T______R______

Ownership Type (Circle One): Public Private

HABITAT EVALUATION:

Dominant Canopy Tree Species: ____________

____

Percent Canopy Cover (Circle One): 0-20% 20-40% 40-80% 80-100%

Understory species: ____________

____

Percent Understory Cover (Circle One): 0-20% 20-40% 40-80% 80-100%

Dominant Age Class (DBH): 0-5" 6-10" 11-15" 16+"

Dead Standing Trees (Circle One): Abundant Several Scarce None

Fallen Logs (Circle One): Abundant Several Scarce None

Man-made Impacts (i.e. evidence and age of logging activity): ____________

____

SWAMP RABBIT ABUNDANCE INFORMATION:

Number of Swamp Rabbits Observed: ____________

Number of Logs Observed with Pellets: ____________

Calculated Area of Log Use (Acres): ____________

Remarks:

ESTIMATED RELATIVE SWAMP RABBIT DENSITY: Abundant Moderate Scarce Absent

Appendix B. Botanical Nomenclature.

Common name	Scientific name
Ash-Green	Fraxinus pennsylvanica
Beech	Fagus grandifolia
Birch-River	Betula nigra
Blackberry	Rubus sp.
Buttonbush	Cephalanthis occidentalis
Catbriar	Smilax sp.
Cottonwood	Populus deltoides
Cypress	Taxodium distichum
Dogwood-Flowering	Cornus florida
Elm-American	Ulmus americana
Elm-Winged	Ulmus alatus
Fleabane	Erigeron sp.
Giant Cane	Arundinaria gigantea
Grape	Vitas sp.
Hackberry	Celtis sp.
Hickory-Bitternut	Carya cordiformis
Hickory-Shagbark	Carya ovata
Hickory	Carya sp.
Japanese Honeysuckle	Lonicera japonica
Jewelweed	Impatiens biflora
Locust-Honey	Gleditsia triacanthos
Maple-Box Elder	Acer negundo
Maple-Red	Acer rubrum
Maple-Silver	Acer saccharinum
Maple-Sugar	Acer saccharum
Maple	Acer sp.
Oak-Bur	Quercus macrocarpa
Oak-Pin	Quercus palustris
Oak-Post	Quercus stellata
Oak-Shummard's	Quercus shummardii
Oak-Spanish	Quercus falcada
Oak-Swamp White	Quercus bicolor
Oak-Yellow Chestnut	Quercus muhlenbergii
Oak	Quercus sp.
Pawpaw	Asimina triloba
Poison Ivy	Toxicodendron radicans
Rose-Multiflora	Rosa multiflora
Sweetgum	Liquidamber styraciflua
Trumpet Creeper	Campsis radicans
Tulip Tree	Liriodendron tulipifera
Tupelo	Nyssa aquatica
Virginia Creeper	Parthenocissus quinquefolia
Willow	Salix nigra

Appendix C. Locations searched for Swamp rabbits in southern Illinois, 1984-85.

County	Site	Location			Swamp[1] rabbits	Search[2] conditions
		Township	Range	Sections		
Alexander	Clear Creek	14S	3W	14, 23	A	C
	Cache River	15S	1W	7, 18, 19, 31	P	C
		16S	1W	6, 7, 18, 19	P	C
		16S	1W	29, 30	P	C
	Horseshoe Lake/Dogtooth Bend	16S	2W	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 22, 30, 31	P	C
	Burnham Island/Big Cypress	16S	3W	1, 3, 11, 12, 14	P	C
	Bumgard Island	17S	2W	5, 6, 7, 8, 16, 17, 21, 22, 26, 27	P	B
	Tamms	14S	2W	36	P	C
		15S	2W	1, 2, 12	A	C
Franklin	Benton West	6S	2E	14, 15, 16, 21, 22, 27, 28, 29, 33	P	B
	Benton East	6S	3E	12	A	C
	Benton East	6S	3E	27	P	A
	Benton East	6S	3E	14, 22, 23	A	FL

Appendix C. Continued.

County	Site	Location			Swamp[1] rabbits	Search[2] conditions
		Township	Range	Sections		
Franklin	West Frankfort	7S	2E	3, 4, 5, 8, 11, 12, 3, 14, 16, 25	C	FL
	Big Muddy	7S	2E	10, 11	A	B
	Big Muddy	7S	3E	5, 32, 33	A	B
	West Frankfort	7S	3E	15, 16	P	FL
	West Frankfort	7S	3E	28, 29, 32, 33	A	FL
Gallatin	Omaha	7S	8E	27, 28, 33, 34	A	B
	New Haven	7S	10E	27, 28, 32, 33, 34	A	AB
		8S	10E	4, 5, 7, 8, 9, 18, 19	A	AB
	Cane Creek	8S	8E	3, 4, 9, 10	A	B
	Ridgeway	8S	8E	26	A	B
	Crab Lake	8S	10E	28, 29	A	B
	Elba	8S	8E	16, 21	A	B
	Shawneetown	9S	9E	1, 11, 12	A	B
	Old Shawneetown	10S	9E	13, 14	A	AB

Appendix C. Continued.

County	Site	Locations			Swamp rabbits[1]	Search conditions[2]
		Township	Range	Sections		
Jackson	De Soto	8S	1W	10, 11, 14, 15, 22, 23	A	C
	Oakwood Bottoms	9S	3W	13, 23, 24, 25, 26, 27, 28, 33, 34, 35	P	FL
		10S	3W	2, 3, 9, 10, 11, 14, 15, 16, 17, 21, 22, 27, 28, 32, 33	P	FL
Johnson	Ozark	11S	4E	21, 28	A	C
	Bumcombe	12S	2E	8	A	C
	Pleasant Grove	12S	2E	19	A	C
	West Vienna	12S	2E	33, 34, 36	A	C
	Vienna Penitentiary	12S	4E	33	A	C
	West Vienna	13S	2E	3, 4	A	C
		13S	2E	9, 14, 16	P	C
		12S	2E	28	A	C
	Cypress	13S	2E	15	A	C
		13S	2E	30, 31	A	C

Appendix C. Continued.

County	Site	Township	Range	Sections	Swamp rabbits[1]	Search conditions[2]
Johnson	Little Black Slough	13S	2E	22, 23, 24, 26, 27	P	C
	Heron Pond Preserve	13S	3E	29, 30	P	C
	Belknap	13S	3E	29, 32, 33	A	C
		14S	3E	5	A	C
	Grantsburg	13S	4E	10, 11, 14	P	C
	Ganntown	13S	4E	21	A	C
	Reeseville Levee	13S	4E	25, 26	P	C
	Lower Cache - Karnak	14S	2E	3, 4, 9, 10, 11, 13	A	C
	Cache River	14S	2E	7, 8, 18	A	FL
Lawrence	East Bittet	3N	11W	26, 35	A	B
Massac	Cache River	14S	3E	4, 5	A	C
		14S	3E	8, 9	P	C
	Boaz	14S	3E	21	A	C
	Mermet Lake	14S	3E	26, 27, 34, 35, 36	P	C

Appendix C. Continued.

County	Site	Location			Swamp[1] rabbits	Search[2] conditions
		Township	Range	Sections		
Massac	Mermet Lake	15S	3E	2	P	C
	Clifty Creek	14S	3E	12	A	C
	Cagle Pond	14S	4E	11	A	B
	Big Bay Station	14S	4E	12, 13	A	B
	New Columbia	14S	4E	21	A	B
	Round Knob	15S	4E	3, 5, 6, 7, 10	A	B
	Fort Massac	16S	5E	8, 9, 15, 16	P	B
	Unionville	16S	6E	6, 9, 13, 14	A	C
	Black Bottoms	16S	6E	19, 21, 24, 25, 26, 27, 28, 34	P	B
Pope	Reeseville	13S	5E	24, 33	A	B
		14S	5E	30, 31	P	B
	Big Grand Pierre	12S	7E	33, 34	A	B
Pulaski	Limekiln Slough	14S	1E	23, 24, 34, 35, 36	P	C
	Kitchel Slough	14S	2E	20, 21, 28	A	C

Appendix C. Continued

County	Site	Location			Swamp[1] rabbits	Search[2] conditions
		Township	Range	Sections		
Pulaski	Post Creek Cutoff	14S	2E	23, 26	P	FL
	Cypress Slough	15S	1W	8, 9, 17, 20	P	C
	Hodges Creek	16S	1E	3, 4	A	A
	Old Cache River	16S	1W	35, 36	A	FL
		17S	1W	2	A	FL
Saline	Texas City	7S	7E	22, 23, 25, 26, 36	A	B
	Galatia	8S	6E	19, 30, 31, 32, 33	A	C
	Harrisburg	8S	6E	35	A	C
		9S	5E	12, 13	A	C
		9S	6E	3, 7, 11, 12, 18	A	C
	Stonefort	10S	5E	13, 16, 19, 20, 21, 24, 27, 29, 33, 34	A	C
	Somerset	10S	7E	6, 7	A	AB
Union	Pomona	10S	2W	16, 21	A	C
	Big Muddy River	11S	3W	4, 9, 12, 13, 17, 18	A	FL

Appendix C. Continued.

County	Site	Location			Swamp[1] rabbits	Search[2] conditions
		Township	Range	Sections		
Union	LaRue Swamp	11S	3W	9, 16	A	C
	Otter Pond-Wolf Lake	11S	3W	28, 33	P	C
	Mississippi River Bottoms	12S	3W	20, 21, 27, 34	?	FL
		13S	3W	2, 11, 14, 23	?	Fl
	Union County Conservation Area	13S	2W	8, 17, 18	P	C
Wabash	Big Slough	2N	12W	36	A	B
		2N	11W	30, 31, 32	A	B
	Grayville	3S	14W	16	A	B
Wayne	Little Wabash-Elm River	1S	9E	20, 21, 22, 27, 28, 29, 32, 33	A	B
Williamson	Hurst	8S	6E	35	A	C
		8S	1E	16, 17, 18, 19	A	A
	Crab Orchard National Wildlife Refuge	9S	2E	22, 27, 28, 33, 34	A	C
		9S	1E	33, 34, 35	A	C
		10S	1E	2, 3, 4, 10, 11	A	C

Appendix C. Continued.

County	Site	Location			Swamp rabbits[1]	Search conditions[2]
		Township	Range	Sections		
Williamson	Cereal Springs	10S	3E	2	A	A
	Cereal Springs	10S	4E	3, 4, 5	A	A

[1] Swamp Rabbits: Absent (A), Present (P)

[2] Search Conditions: Post-flooding (A), After green-up (B), Conditions favorable (C), Flooded (FL)

APPENDIX D. Site descriptions where Swamp rabbit were found in southern Illinois, 1984-85.

Site: Northeast Horseshoe Lake.

County: Alexander.

Size: 800 ha.

Ownership: State.

Rabbit abundance: Moderate.

Vegetation: Closed canopy dominated by 25-50 cm dbh bottomland oaks, with cottonwoods and sycamore common. Understory sparse.

Comments: Flooding only at highest stages of Mississippi and Ohio rivers. Area broken up by intersection of Highway 3 and a county road; two road-killed swamp rabbits found near intersection.

Site: Bumgard Island.

County: Alexander.

Size: 613 ha.

Ownership: Anderson-Tully Timber Co.

Rabbit abundance: High.

Vegetation: Mostly open canopy is dominated by 25-35 cm dbh cottonwood, box elder, plantations dominated by cottonwood. Understory dense under open canopies, sparse in plantation.

Comments: Entire island may be flooded for periods up to 2 months in the spring and less often at other times. Nearly 400 ha heavily selection cut in 1981. Leased for hunting club. Abundant slash from logging provides excellent cover. Located between levee and Mississippi River.

Appendix D., cont.

Site: Burnham Island.

County: Alexander.

Size: 465 ha.

Ownership: Most by state, also in part by private.

Rabbit abundance: Moderate to high.

Vegetation: Closed canopy dominated by willows and cottonwoods, size mixed. Ground cover sparse.

Comments: Flooding similar to Bumgard; area between levee and main channel of Mississippi River. North end is higher, and can be accessed by hunters without boats during fall. Some hunting pressure.

Site: Dogtooth Bend.

County: Alexander.

Size: 375 ha.

Ownership: Several private.

Rabbit abundance: High.

Vegetation: Cottonwood and willows, similar to Burnham and Bumgard Islands.

Comments: Small amount of habitat located between levee and Mississippi River, but most forest located on east side of Dogtooth Bend. In part continuous population with Bumgard. Area on east side not searched, but undoubtedly supports rabbits. Jerry Garver (Biologist, IDOC, pers. comm) reported killing rabbits there on hunts within the past 5 years. Flooding intense between levees, less in areas protected by levee.

Appendix D., cont.

Site: Big Cypress.

County: Alexander.

Size: 245 ha.

Ownership: Private.

Rabbit abundance: Moderate.

Vegetation: Bottomland oaks, cottonwoods, willows, hickories, and silver maple in 20-40 cm dbh stage. Canopy closed.

Comments: Old logging roads provide openings with brushy cover. Protected by levee; flooding only at very highest stages of Mississippi and Ohio rivers.

Site: Horseshoe Lake Nature Preserve.

County: Alexander.

Size: 150 ha.

Ownership: State.

Rabbit abundance: Moderate.

Vegetation: Closed canopy dominated by mixed bottonland oaks. Groundcover mostly sparse, except in 3 small openings with dense cover of grape, blackberry and elderberry.

Comments: Flooding common in spring, but generally insignificant to rabbits. No public access to island and the area is secure from disturbance. Known population of at least 15 rabbits during fall 1984.

Appendix D., cont.

Site: Cache - South.

County: Alexander.

Size: 620 ha.

Ownership: Private, small amount by Westvaco Co..

Rabbit abundance: Low.

Vegetation: Closed canopy dominated by bottomland oaks, with maples, hickories, and sycamore common. Most trees in the 15-25 cm class.

Comments: Flooding intense in spring from Cache River. Generally consists of small (100) ha woodlots connected by thin ribbon of woods along river with farming up to edge. Area extends from Frog City to Tamms.

Site: Little Black Slough-Heron Pond.

County: Johnson.

Size: 750 ha.

Ownership: Most state, some private.

Rabbit abundance: Low.

Vegetation: Bottomland oaks, sweetgum, elm, and maple dominate a closed canopy. 85% early growth stage, 15% old. Most rabbit use along borders of Cypress-Tupelo swamps. Rabbit use scattered, densities range from moderate to extremely low. Site classified as Nature Preserve. Flooding unknown, but adequate uplands as potential refuge.

Appendix D., cont.

Site: North Reevesville.

County: Johnson.

Size: 160 ha.

Ownership: Several private, also USFS.

Rabbit abundance: High.

Vegetation: Moderate closed canopy of 15-25 cm dbh elms and red maple, dense ground cover of vines, blackberry, and giant cane.

Comments: Located along Bay Creek, levee and railroad tracks probably make flooding insignificant, and may be drying out area. Regularly hunted by locals.

Site: Grantsburg.

County: Johnson.

Size: 250 ha.

Ownership: Private, state, USFS.

Rabbit abundance: Moderate.

Vegetation: Relatively closed canopy dominated by 40+ cm dbh elm, red maple, oaks, and sweetgum. Moderate ground cover.

Comments: Half of the area flooded during a May search. Located on Bay Creek 4.5 km north of Reevesville site, hunting pressure probably similar.

Appendix D., cont.

Site: Black Bottoms.

County: Massac.

Size: 690 ha.

Ownership: Private.

Rabbit abundance: Low.

Vegetation: Mature bottomland oaks, sweetgum, and elm dominate the closed canopy floodplains. Swamp portions with cypress and tupelo. Sparse ground cover.

Comments: Area generally consisits of small (>130 ha) woodlots connected by thin strips of woods; some woodlots isolated but within dispersal capabilities. 363 ha are registered voluntarily with The Nature Conservancy. Searched in May; abundance is uncertain. Located on Ohio River floodplain.

Site: Mermet Lake Conservation Area.

County: Massac.

Size: 560 ha.

Ownership: State.

Rabbit abundance: Low.

Vegetation: Floodplains dominated by 25-45 cm dbh bottomland oaks, red maple, sweetgum, green ash, and river birch. Ground cover moderate.

Comments: Much of area is managed as greentree reservior; it is flooded most of fall and winter. Rabbit use concentrated in early successional birch and mature pin oak. Area open to hunting; pressure on swamp rabbits is unknown.

Appendix D., cont.

Site: Fort Massac State Park.

County: Massac.

Size: 140 ha.

Ownership: State.

Rabbit abundance: Low.

Vegetation: Closed canopy dominated by 40+ cm dbh cottonwood and red maple. Ground cover sparse.

Comments: Generally a 50-100 m wide strip along the Ohio River. Reports of the site came from a hunter-cooperator who killed rabbits there during the 1984-85 season.

Site: Northwest Massac.

County: Massac.

Size: 25 ha.

Ownership: Private, industrial forestry.

Rabbit abundance: Moderate.

Vegetation: Closed canopy, pole-size stand of sweetgum, green ash, and red maple. Dense stands of blackberry and honeysuckle in openings along railroad tracks.

Comments: Located along Cache River, this was the smallest site found to support swamp rabbits. Use concentrated in dense understory. May be within dispersal distance of another unknown population, but 80 ha site searched 300 m from here lacked rabbit sign.

Appendix D., cont.

Site: Union County Conservation Area.

County: Union County.

Size: 800 ha.

Ownership: State.

Rabbit abundance: Low.

Vegetation: Closed canopy dominated by bottomland oaks and hickories, also sweetgum and green ash in 30-40 cm dbh class. Limited ground cover.

Comments: Located on Mississippi River floodplain, now protected by levee. Flooding occurs as overflow from Clear Creek, Lyerla Lake, and Grassy Lake, and is significant in spring and also at times of high local precipitation. Rabbits in area generally unhunted, but occasionaly captured accidently by local trappers.

Site: Wolf Lake Bottoms.

County: Union.

Size: 80 ha.

Ownership: USFS and I.M.C. Chemical Co..

Rabbit abundance: Low.

Vegetation: Bottomland oaks, hickories and maples dominate canopy, with moderately abundant ground cover.

Comments: Adjacent to LaRue Swamp, but no rabbits found there. Small size and absence of nearby populations make this population vulnerable. Forest consists of a thin strip between bluffs and Wolf Lake and Otter Pond. Site is located on the Mississippi River floodplain, but now protected by levee.

Appendix D., cont.

Site: Southeast Union.

County: Union.

Size: 800 ha.

Ownership: Private.

Rabbit abundance: Unknown.

Vegetation: Cottonwood, elm, and maple dominate the canopy, understory unknown.

Comments: Flooding at time of search limited observations to levee, status of rabbits at site unknown but probable. Site located less than 3.5 km from the Union County Conservation Area, a site known to support rabbits. Most habitat between the levee and the Mississippi River; flooding similar to Burnham and Bumgard.

Site: West Grand Chain.

County: Pulaski.

Size: 230 ha.

Ownership: Private, most by Westvaco Timber Co..

Rabbit abundance: Low.

Vegetation: Closed canopy, with sycamores, hickories, and pin oak in the 25-40 cm dbh class dominating. Understory growth limited.

Comments: Part of area clearcut, additional trees marked for future logging. Located near the Cache River, the area is generally wet, but a drainage ditch may be drying the site. Abundant cover in clearcut.

Appendix D., cont.

Site: Post Creek Cutoff.

County: Pulaski.

Size: 210 ha.

Ownership: Private individuals and Westvaco Co..

Rabbit abundance: Low.

Vegetation: White oak, pin oak, hickory, and green ash dominate the site, much of which is regeneration from a recent clearcut. Canopy mostly open allowing moderate ground cover.

Comments: Abundant cover from slash and regeneration, use concentrated along brushy edges of cut.

Site: Cypress Slough.

County: Pulaski.

Size: 100 ha.

Ownership: Private.

Rabbit abundance: Low.

Vegetation: Swamp species dominated by cypress and tupelo, floodplain by pin and chestnut oak. Abundant understory on floodplain.

Comments: Most of site is swamp, with only suitable habitat along borders. Rabbit use limited to thin strip around swamp. Small portion recently clearcut. Area is continuous with swamp along the Cache River; probably receives immigrants to allow continuence of population.

Appendix D., cont.

Site: Stafford Bluff.

County: Pope.

Size: 75 ha.

Ownership: Private commercial (bank).

Rabbit abundance: Moderate.

Vegetation: Moderately open canopy dominated by red maple and cottonwood, with good ground cover of herbaceous and woody plants.

Comments: Bordered by Highway 145 and bluffs, Bay Creek runs along base of bluffs. Rabbit use mostly along bluffs rather than along swampy border.

Site: Big Muddy.

County: Franklin.

Size: 1509 ha.

Ownership: Private, most owned by banks and some by lumber company.

Rabbit abundance: Extremely low.

Vegetation: Bottomland oaks, river birch, silver maple, and elm dominate the mostly closed canopy; understory generally sparse.

Comments: Rabbit sign was found at 3 of 14 sites visited in vacinity; nearly 5000 ha of continuous habitat so impossible to deliniate occupied areas. Most of area floods severly in spring; area lacks levee system. Probably extremely low density, discontinuous populations scattered throughout. Ownership by banks appears to be investment, possibly for future farmland or energy.

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Appendix D., cont.

Site: Oakwood Bottoms.

County: Jackson.

Size: 4,000 ha.

Ownership: USFS, small amount private.

Rabbit abundance: Extremely low.

Vegetation: Mostly bottomland oaks, plantations with ash and pin oak. Understory sparse in most areas.

Comments: This site probably represents the largest continuous tract of bottomland forest in southern Illinois. Approximately 1,400 ha are managed as greentree reservior, and 1,400 ha as plantations. Area searched by canoe during flooding, so abundance is questionable.